The Knowledge Modeling for Chronic Urticaria Assessment in Clinical Decision Support System with PDA

Miyoung Kwak, Seung-Bin Han, Gyochang Kim[1], Jinwook Choi MD Ph.D, Jonghoon Chun Ph.D[1] , Kangsun Lee Ph.D[1], Heeseung Bom, MD, Ph D[2], Sanggoo Lee Ph.D[3]

Department of Biomedical Engineering, College of Medicine, Seoul National University,
[1]Division of Computer Science & Engineering, Myoungji University,
[2]Department of nuclear medicine, College of Medicine, Chonnam University,
[3]Division of Computer Science, Seoul National University, Korea

Abstract

The benefits of a clinical information system would be enhanced by a clinical decision support system (CDSS). We have developed urticaria diagnosis knowledge model for clinical practice. In order to construct a more accurate, evidenced-based and comprehensive knowledge base for urticaria, we arranged and integrated knowledge from literatures-based knowledge, as provided by; The Korean Academy of Asthma and Allergy [1], the American Allergy Association based on an algorithm of chronic urticaria assessment. We present this knowledge in a Boolean cross table frame and implemented these guidelines using the developed CDSS.

Background

Urticaria is a distressing disorder, which affects an estimated 20 percent of the population at one time or another. We obtained information about urticaria in terms of the laboratory tests that have to be implemented and chronic urticaria patient history in terms of meeting the requirement of the algorithm. This study was designed to meet the following objectives.

- To fully represent urticaria knowledge for computer system based on theoretic knowledge of the presentation concepts.
- To extracting known factors from viable literatures and text to allow optimal clinical judgments based on algorithms of chronic urticaria assessment.

Methods

This study is based on a literature search for computer-based guideline-specific representation models, termed a 'cross table model' which is a statistical procedure for ascertaining an existence of association between two variables. To identity these relations in urticaria requires different kinds of tests involving multiple steps. Since there are many types of urticaria, which behave in similar patterns ways, the process also requires differentiation of related forms of urticaria. The guideline contains the information of clinical finding of urticaria and the results of laboratory testing performed to assess urticaria

Results

Knowledge representation in Boolean cross table

From the constructed table, firstly, we found that the number of collection of questions is total 150 concerning factors extracted from literatures. Ninety questions concerning patient history were classifiable into 13 question groups and 60 questions related to laboratory test results. The total numbers of urticaria type are 17.

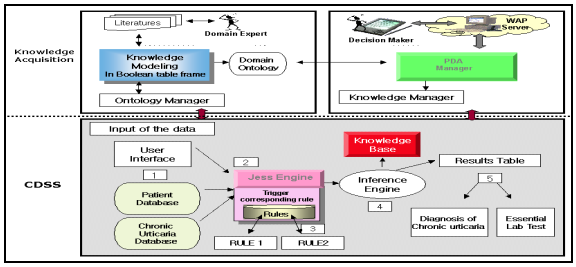

Figure1. Knowledge acquisition process and Architecture of clinical decision support system (CDSS)

Second, we checked appropriateness of questions mapping to each correspondent classification of urticaria using Boolean frame concept representation of patient urticaria history and of laboratory test results.

The CDSS is implemented under the Windows 2000 server in JESS, which is a productive language and the core of the inference engine for the expert system as shown in Figure1. Urticaria Management consisted of a large set of heuristic rules for the reasoning process concerning various aspects of urticaria management in the medical field. These rules are chained by the inference system to form conclusions about recommended urticaria therapy. In the inference engine, we usually use rule template 'IF-THEN'.

The CDSS interface is divided to 3 parts; i.e Uriticaria, ROS, and PH. Each part has several menus which contain essential questions as shown in Figure 2.

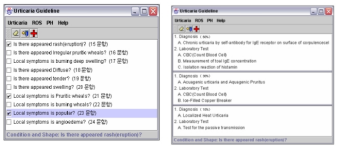

Figure2 Questions and Results for Chronic urticaria assessment

Discussion

We present the processes involved in the development of a shared guideline representation and suggest ways of developing more complete and accurate urticaria representation for future use. In particular, we aim to develop a clinical decision support system with PDA for point of care use by physicians

Reference

[1] Clinical guidelines provided by the Korean Academy of Asthma and Allergy. Vol.20 Dec.2000.